

# North America Land Cover Summit

September 20-22, 2006  
National Academy of Sciences  
Washington, DC

## Utilizing Land Cover I: **Applications in Human and Environmental Realms**

**Mid-West Geospatial Partnership**

Presented  
by  
**Dr. Jon F. Bartholic, Director**





## Midwest Spatial Decision Support System Partnership

<http://www.epa.gov/waterspace/>

# Midwest Partnership for Watershed Management Decision Support Systems

Origin: April 2002

Midwest Web-based Spatial Workshop in Chicago

Co-hosts:	US EPA Region 5, Michigan State University, and Purdue University
Purpose: Decision	Demonstration of various Support and GIS Systems
Participants:	State, Federal, and Tribal water resource managers Land Grant University Extension community, Watershed managers, and local government representatives



# Unique & Emerging Characteristics Of The Tools

In demand by

local officials, natural resource managers, and the general public

because they deliver ease of use, bundled data,  
and means of clear impact analysis:

# Future Directions

- Develop Web Portal for Spatial Decision Support Tools
- Provide Web-accessible Data and Modeling Tools at Multiple Spatial Scales
- Serve Multiple Federal and Local Government Agencies
- Assist Local Communities in Their Environmental Decision Making



**A PARTNERSHIP**  
with  
**“SOMETHING EXTRA”**

# Great Lakes National Program Office

[Midwest Spatial Decisions Support Systems Partnership](#)

## Partnership for Watersheds

# Local Decision Makers come to The Gateway:

Digital Watershed

L-THIA

ATtILA

T O O L S

AGWA

ReVA

National Environmental Computing Infrastructure  
*with online environmental modeling*  
World Wide Web  
*the universal business platform*

Created by Zenny K. Sadlon

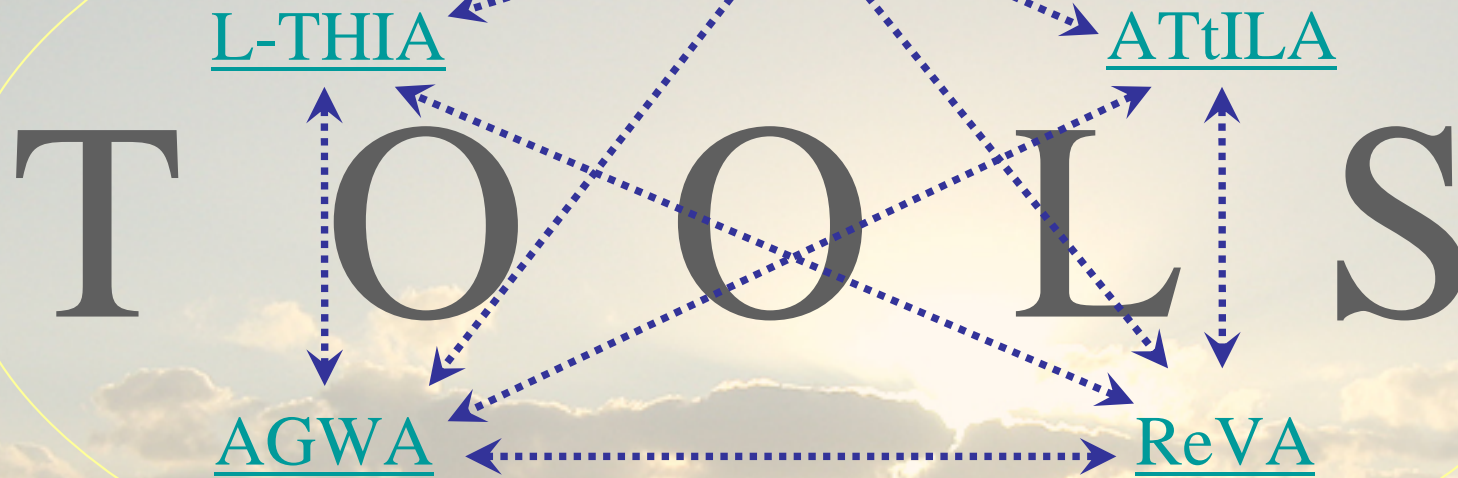
Institute of Water Research





# Local Decision Makers come to The Gateway:

Digital Watershed



National Environmental Computing Infrastructure  
*with online environmental modeling*  
World Wide Web  
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Created by Zenny K. Sadlon

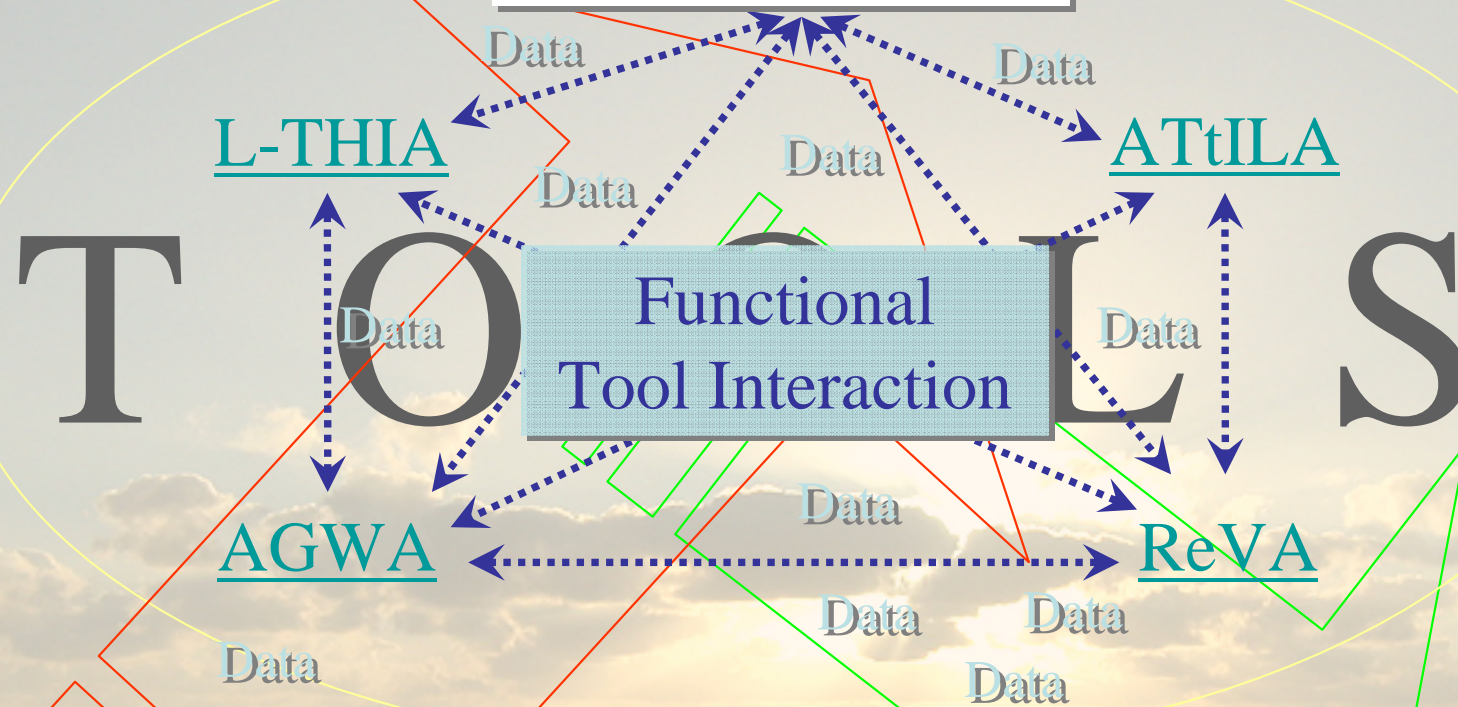
Institute of Water Research





# Local Decision Makers come to The Gateway:

## Digital Watershed



Data  
Data  
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Data

Data  
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Data  
Data  
Environmental Profiles  
leading to  
**Informed Decisions**  
by Local Decision Makers

National Environmental Computing Infrastructure  
with online environmental modeling  
World Wide Web  
the universal business platform

Created by Zenny K. Sadlon



# Digital Watershed



Sponsored in part by:  
CORRIS Great Lakes Regional Water Quality Program  
Environmental Protection Agency  
Michigan Agricultural Experiment Station  
Midwest Spatial Decision Support System Partnership  
United States Geological Survey

## A Nationwide Web Application Tool for Effective Watershed Management

<http://www.iwr.msu.edu/dw>



# Introduction

- Centralized Hierarchical Information Repository
- Online Watershed Computing Center
- Comprehensive Datasets of EPA BASINS
- Online Environmental Modeling

# Overview

- Nationwide Watershed Coverage
- Multiple Forms of Access
- Comprehensive Datasets
- Scaling Function
- Online Environmental Modeling
- Erosion and Deposition Modeling Online



# Nationwide Watershed Coverage



*Digital Watershed*



*address entry*

*map entry*

*site info*



# Multiple Forms of Access



*Digital Watershed*



*address entry*

*map entry*

*site info*

**Please Type in Your Address :**

Street Address:

City:

State:

Zip Code:



Institute of Water Research 





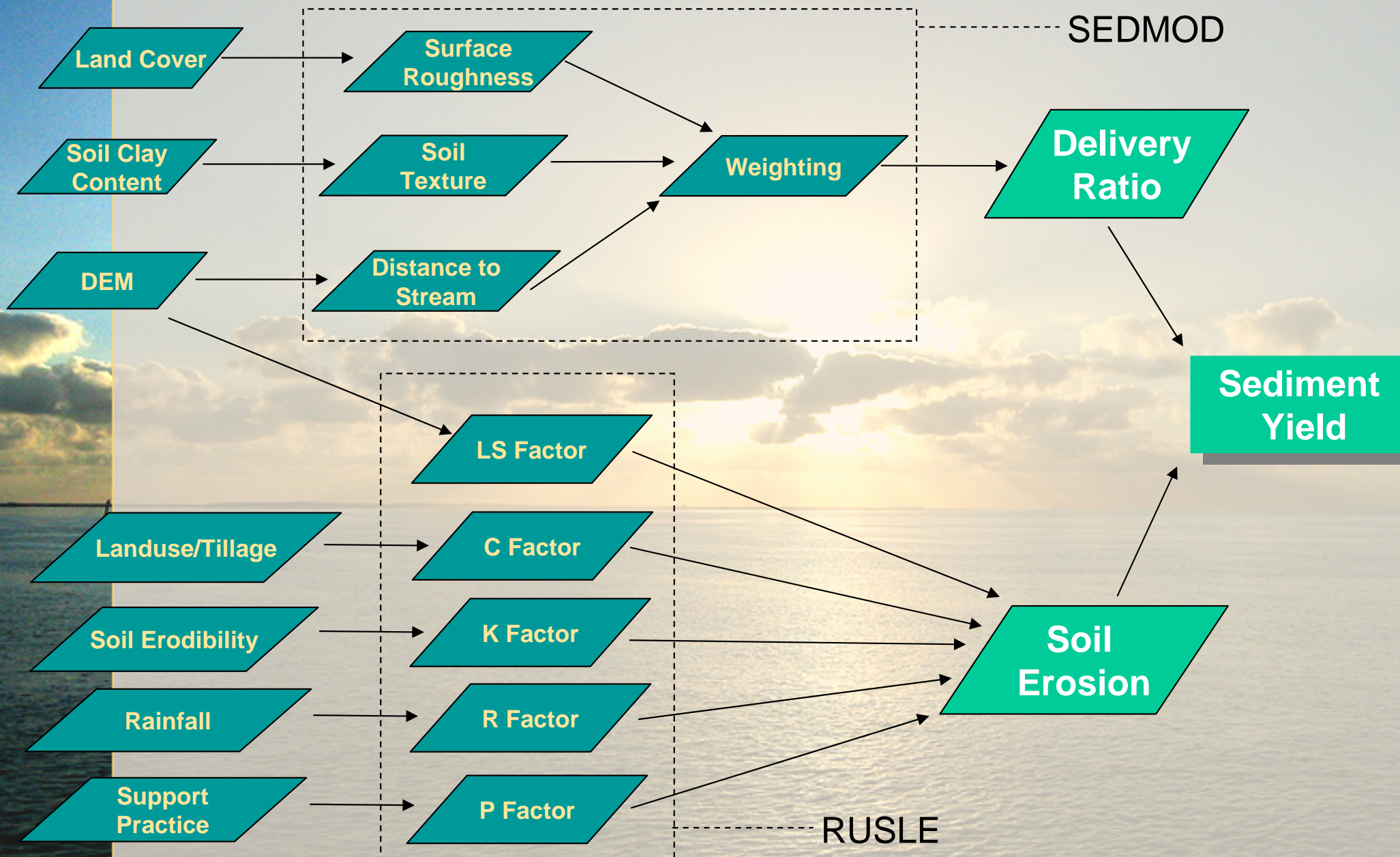
Imagery © GlobeXplorer





# Land Cover for Modeling Rural Landscapes


# A Flowchart of Modeling







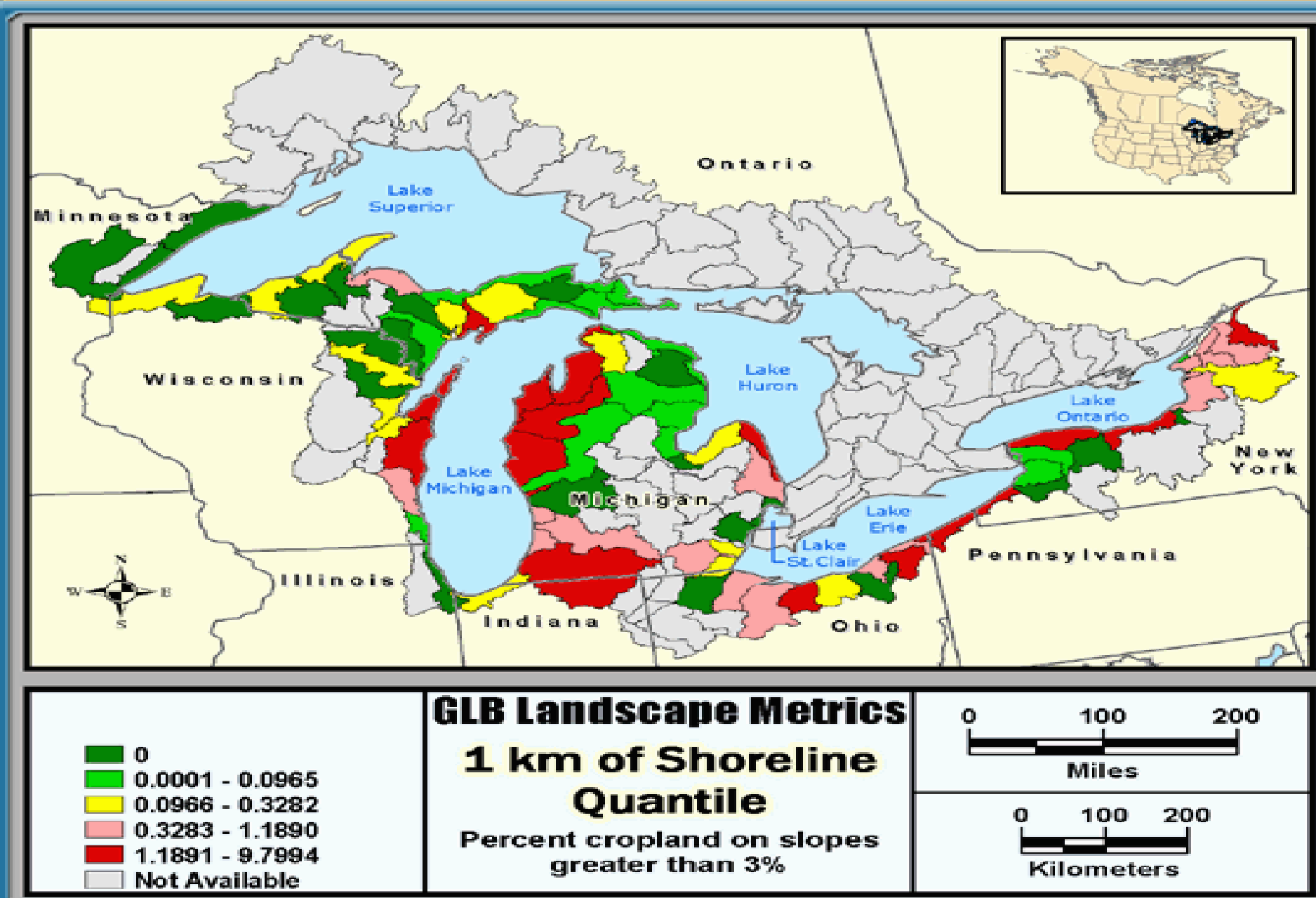
# Land Cover at Different Scales

The background of the slide features a sunset over a body of water. The sun is low on the horizon, creating a bright, golden glow that reflects on the water's surface. The sky is filled with soft, white clouds. On the left side of the slide, there is a vertical strip showing a closer view of the water and the horizon line under a blue sky with some clouds.

# Enhanced Usefulness of Great Lakes Basin Landscape Ecology Metric



# Sediment Flowing to Coastal Wetlands (SOLEC ID:4516)



# SCIENCE-BASED Watershed Management

## Map Information

Zoom Factor:

Key Map



## Legend

Watershed Boundary



StreetMap USA



Airport



Highway



Primary road



Secondary and connector



Water body



Park



State

River



Ag Erosion (Tons/Acre/Year)



< 2



2 - 4



4 - 6



> 6



No Data

## GIS Tools

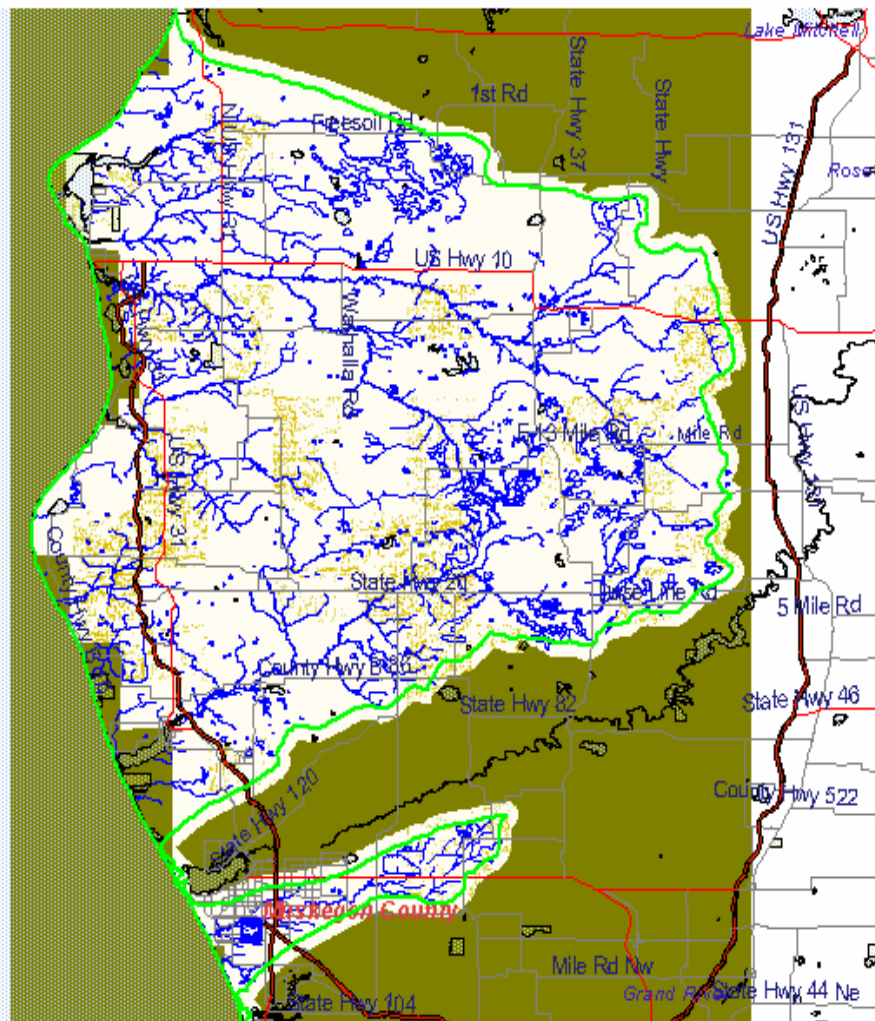


\* GET UPDATED MAP \*

Active Layer

Data Layer

- ☐ ☐ Photo from TerraServer
- ☒ ☒ Streets
- ☐ ☐ Permit Compliance System
- ☐ ☐ Industrial Facilities Discharge Sites
- ☐ ☐ Toxic Release Inventory
- ☐ ☐ Water Quality Stations
- ☐ ☐ Bacteria Stations
- ☐ ☐ National Sediment Inventory Stations
- ☐ ☐ USGS Gage Stations
- ☐ ☐ Water Quality Observation Stations
- ☐ ☐ WDM Weather Data Stations
- ☒ ☒ River
- ☐ ☐ State Soil



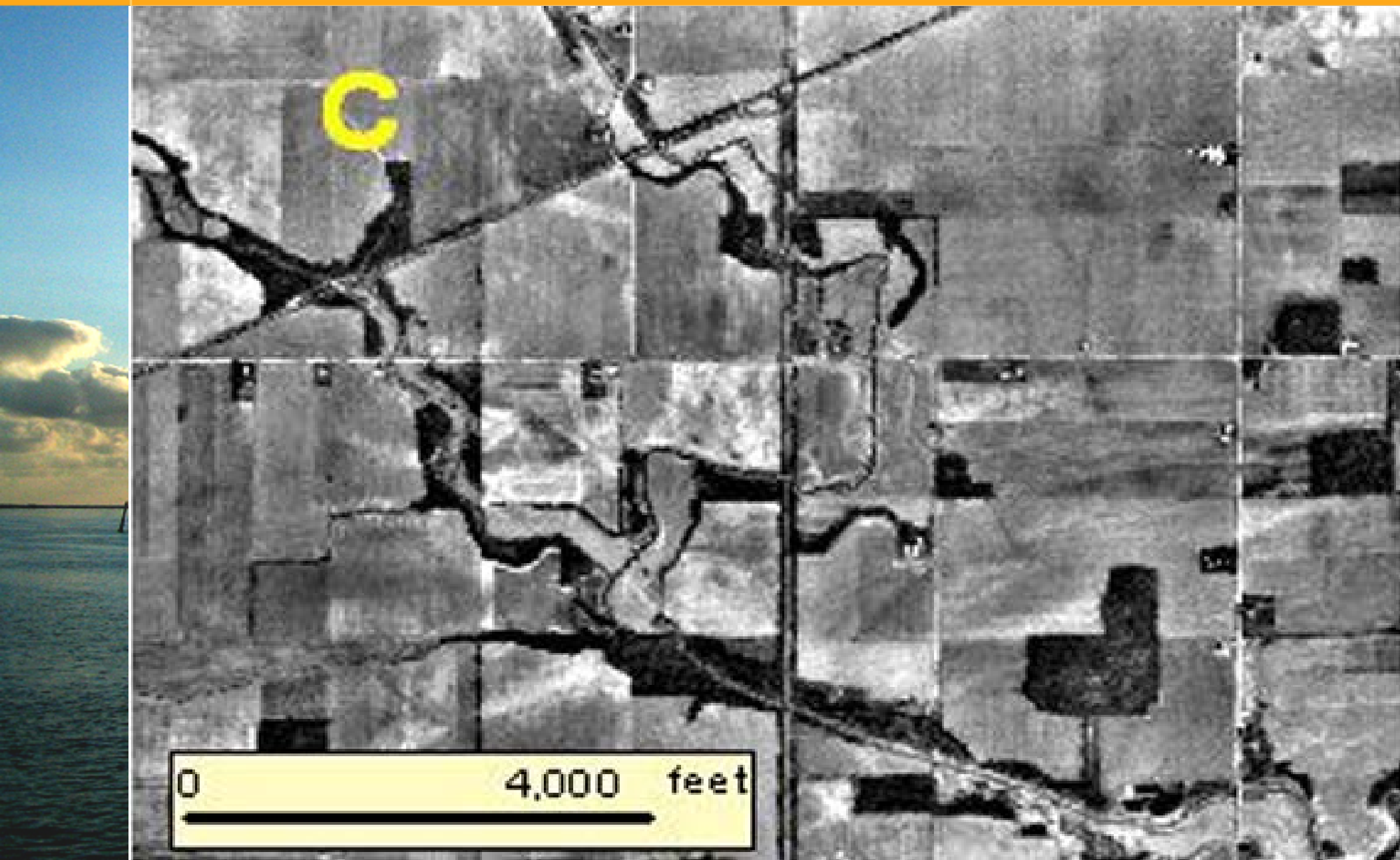
Scale 1 : 1.00134e+006



# High Impact Targeting (HIT) System

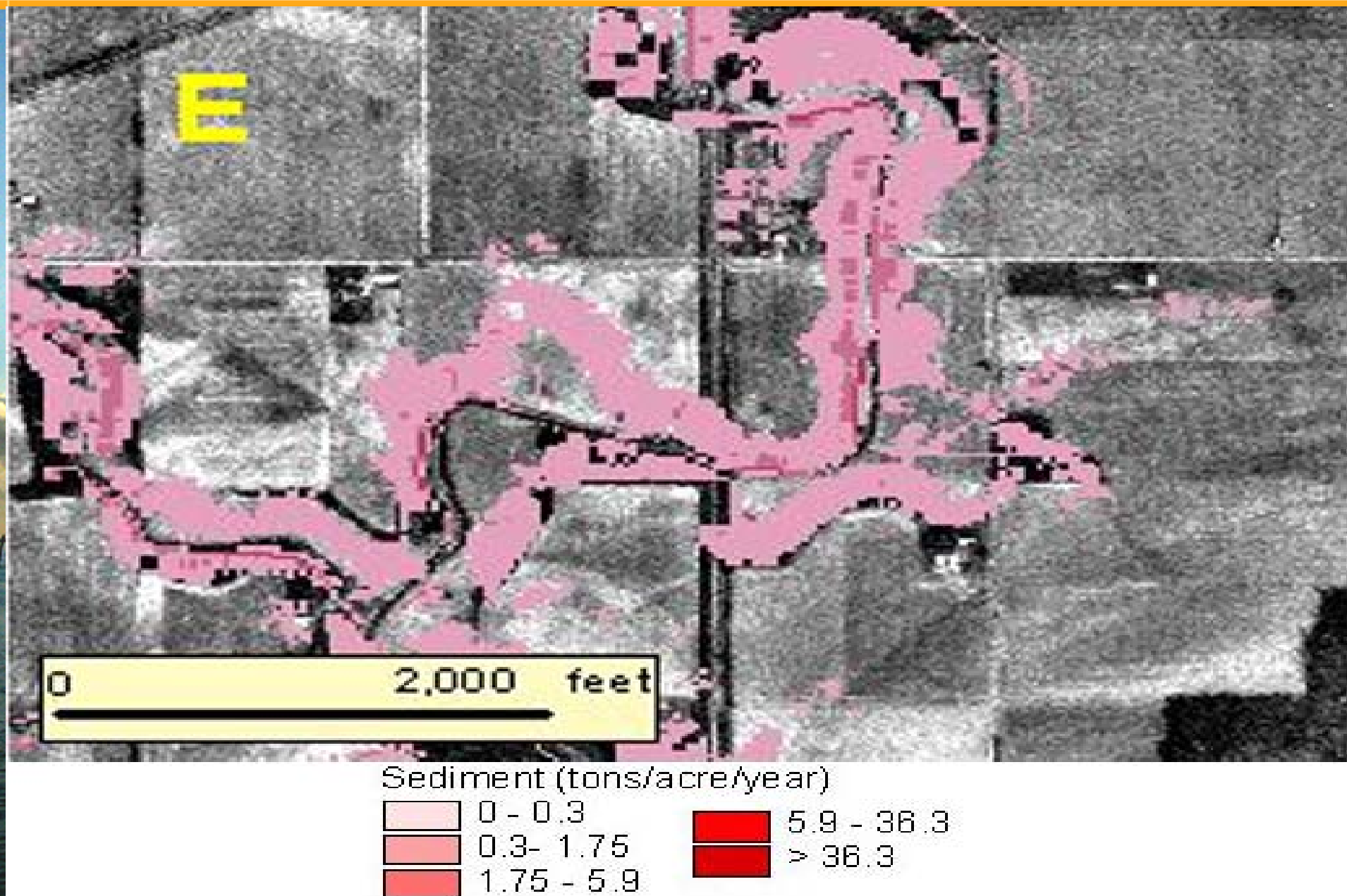
Use of the High Impact Targeting (HIT) GIS Web-accessible System is demonstrated in the following figures. Over the web, sediment risk maps can be examined and “zeroed” in on to locate high potential sediment delivery sources (fields).

“C” shows further enlargement with a photographic overlay of the area.





Specific problem areas can be interpreted from segment “E” by overlaying the sediment risk map over the photograph.





# Land Cover for Modeling Urban/Rural Landscapes



# Map Information

Zoom Factor:

Key Map



## Legend

Watershed Boundary



StreetMap USA

- Highway
- Primary road
- Secondary and connector
- Local road
- Access road

Streams



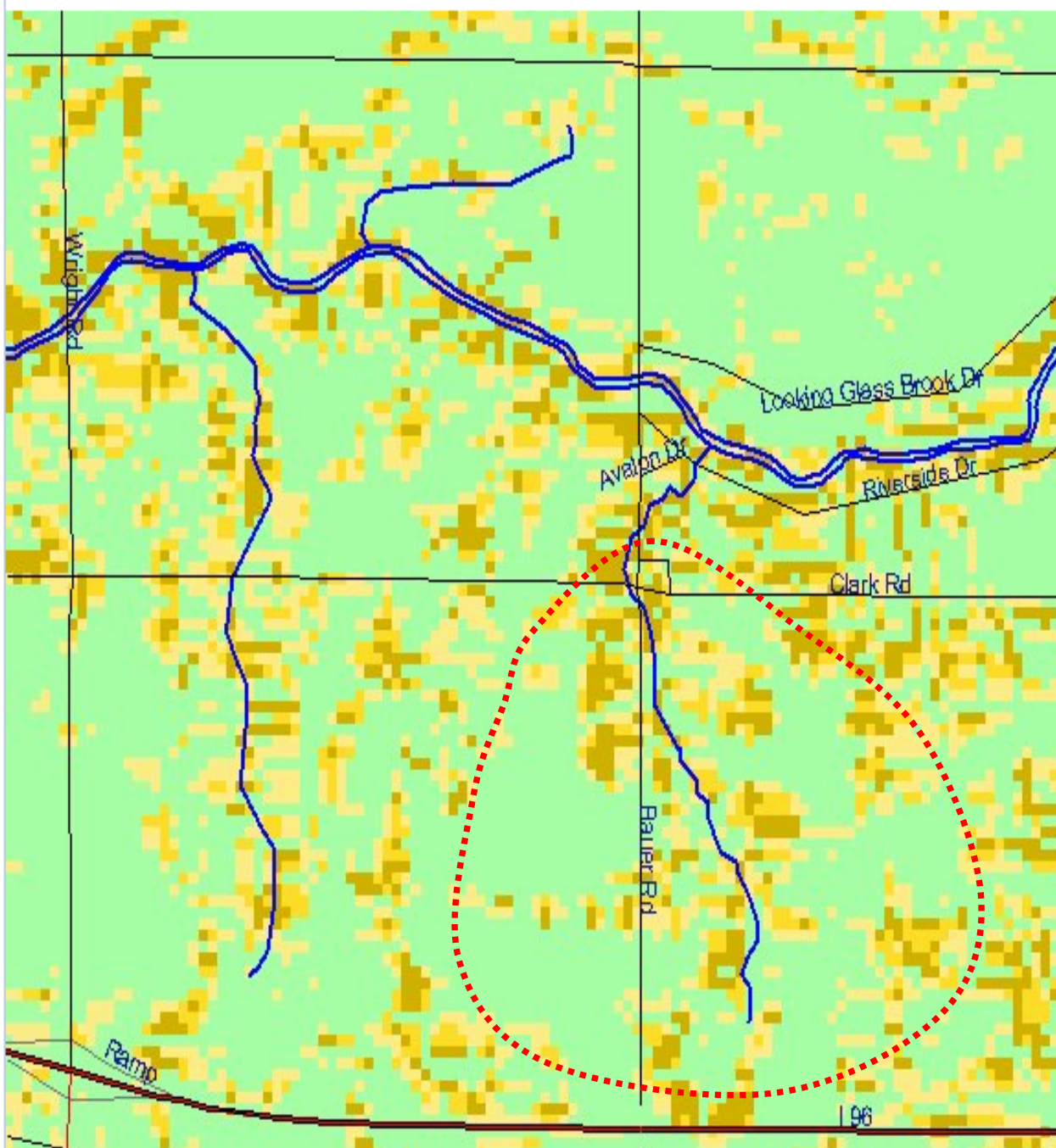
Ag Erosion (Tons/Acre/Year)

- < 2
- 2 - 4
- 4 - 6
- > 6
- No Data

HUC



## GIS Tools



Scale 1 : 26571.9

**\* GET UPDATED MAP \***

Active Layer

Data Layer

- ☒ Streets
- ☒ Streams
- ☐ Water Body
- ☐ Topo Lines
- ☐ Wetlands
- ☒ Ag Erosion
- ☐ Elevation
- ☒ Photo
- ☒ HUC



If you are having difficulty using the Online Help Center or difficulty using the map, please call our support line (517)-432-5586.

# Queried results for spatial data

Queried results for spatial data		
Watershed Area (acres)		64.9
Land use	Soil group	Area(acres)
Agriculture	A	45.6
Agriculture	B	0.4
Grass/Pasture	A	17.2
Grass/Pasture	B	0.2
Forest	A	0.9
Total Area		64.7

Watershed maps

If you want to review the maps extracted,

[click here to change land use in your watershed and to see the Mapserver GIS display](#)

If you want to download the maps extracted, click link below

[Download Page](#)

Land use and Hydrologic Soil Group data were prepared, so you can conduct long-term hydrologic impact analysis (L-THIA) for the watershed. Click the button named "Data preparation and run L-THIA ", and a completed L-THIA form for running the L-THIA model will be displayed. In a similar manner, you can estimate peak runoff rate from the watershed using SEDSPEC. You can also estimate the amount of impervious area in your watershed.

Calculate watershed % of Impervious area

Data preparation and Run L-THIA

Run SEDSPEC for Erosion Control Structures Design

Run Peak Runoff Estimation using SEDSPEC





# Land Cover for Watershed/Ecological Assessment

# Digital Watershed Tool Bar



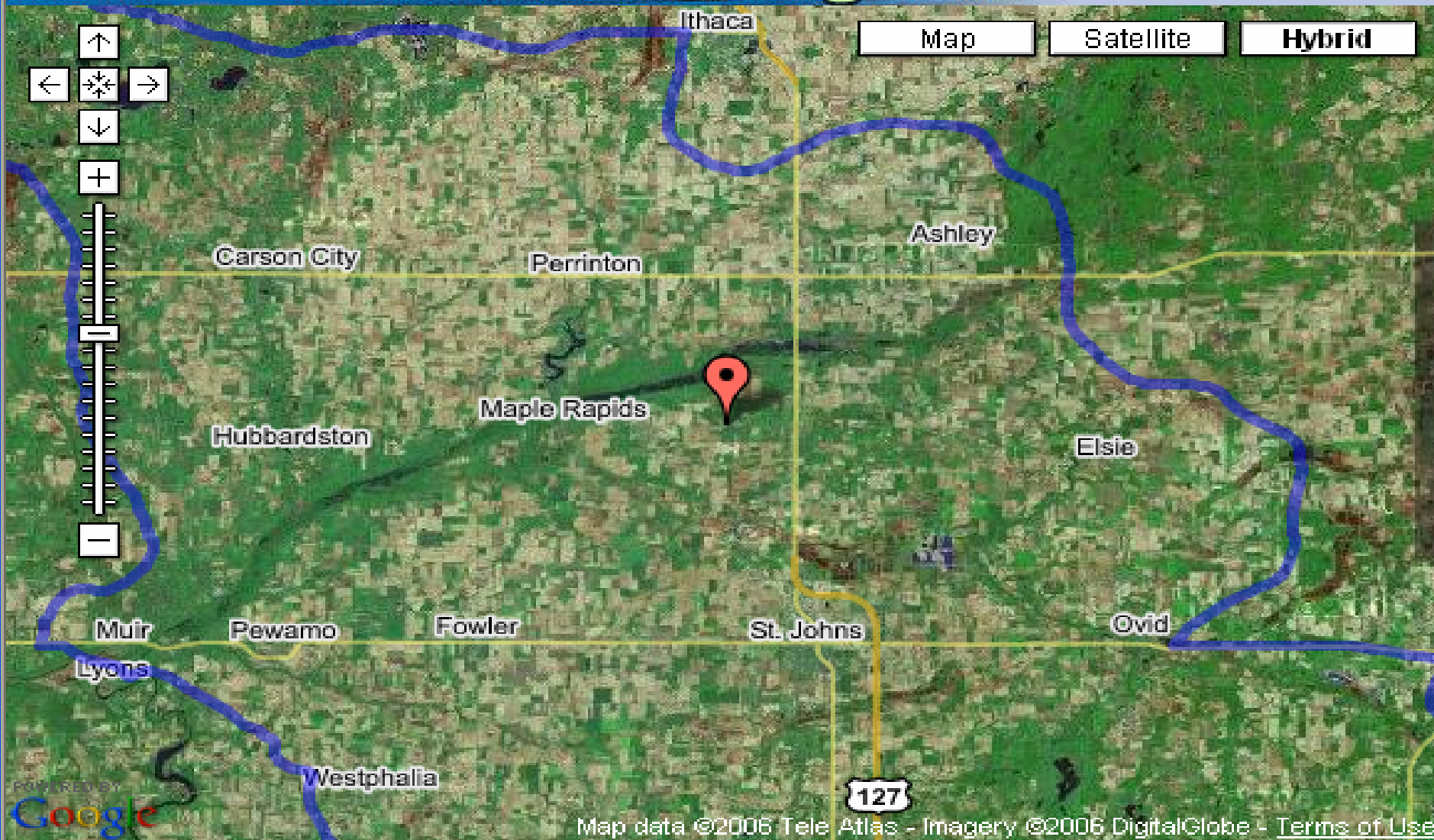


# SCIENCE-BASED Watershed Management



[Explore Your Watershed on Google Earth](#)

# SCIENCE-BASED Watershed Management



[Explore Your Watershed on Google Earth](#)

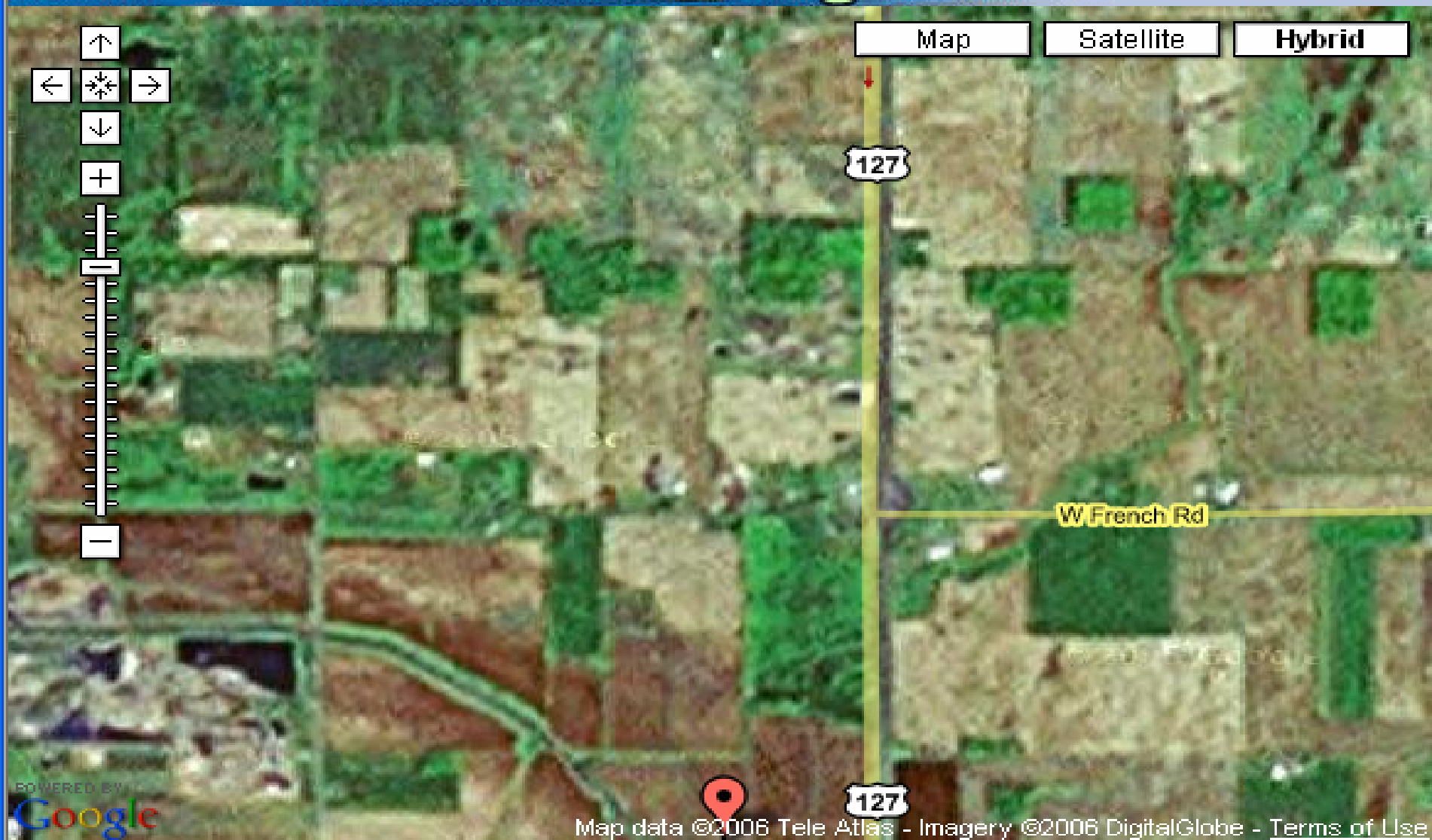


# SCIENCE-BASED Watershed Management



[Explore Your Watershed on Google Earth](#)

# SCIENCE-BASED Watershed Management

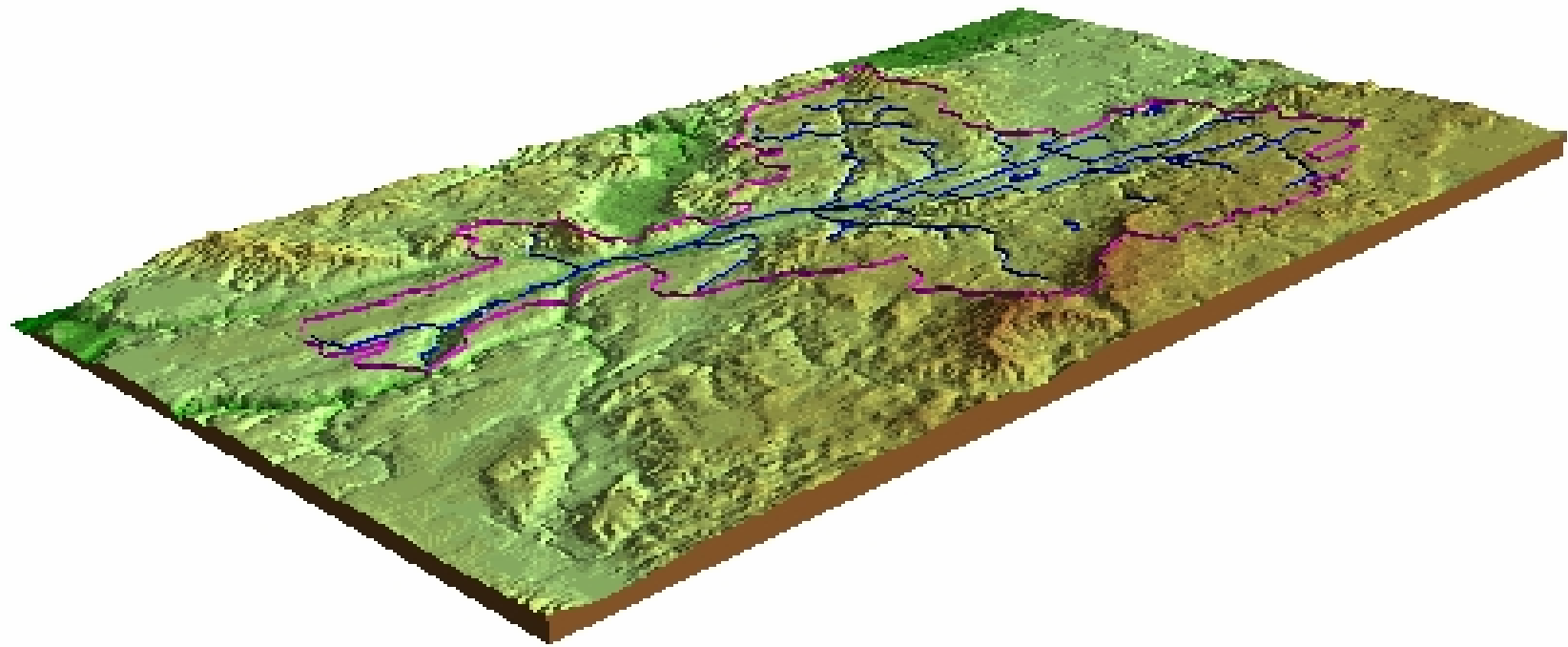


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[Explore Your Watershed on Google Earth](#)



# SCIENCE-BASED Watershed Management

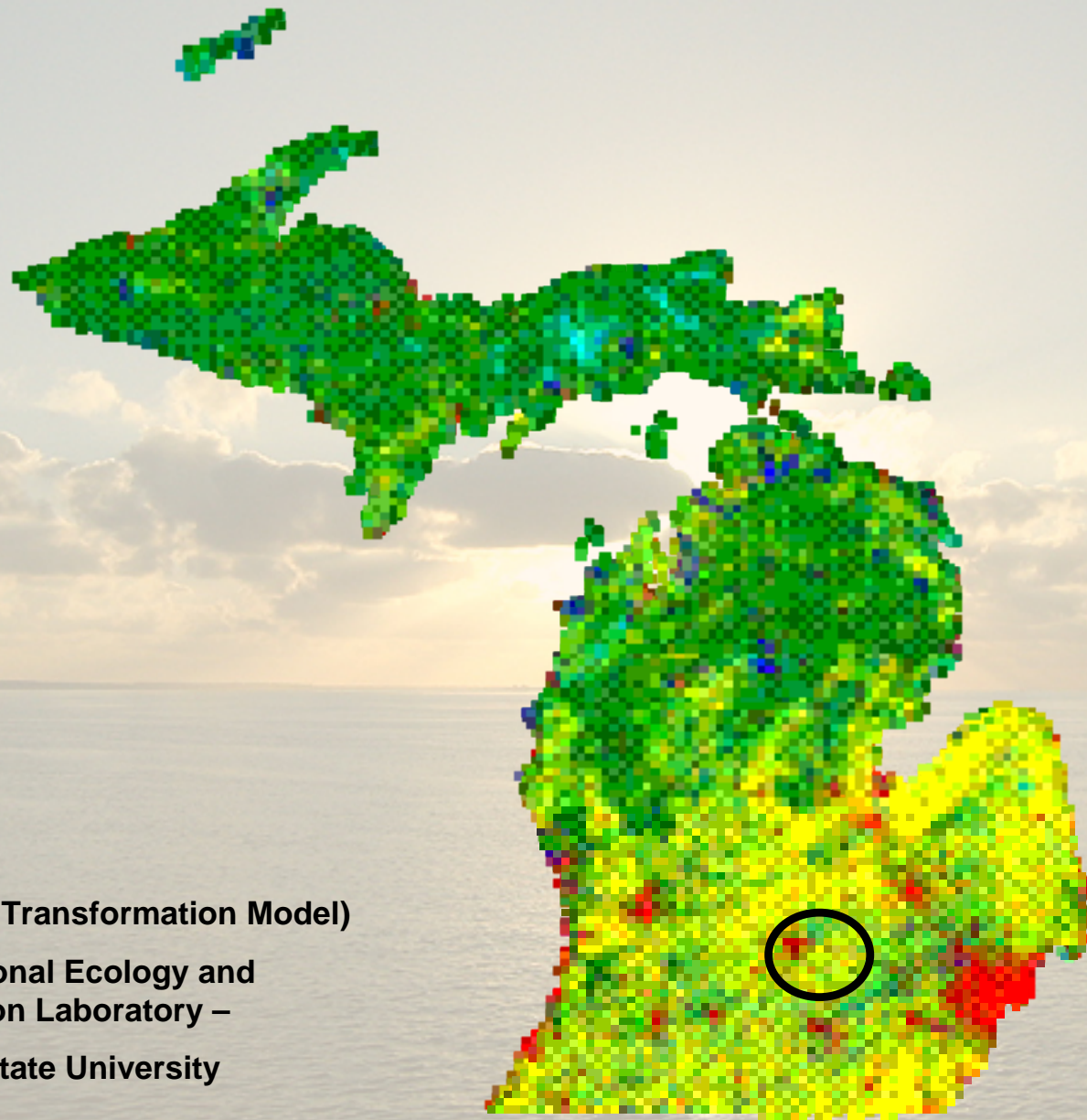


**3D Visualization of Topography  
(From Southwest)**

# THE FUTURE



# Landuse 2080



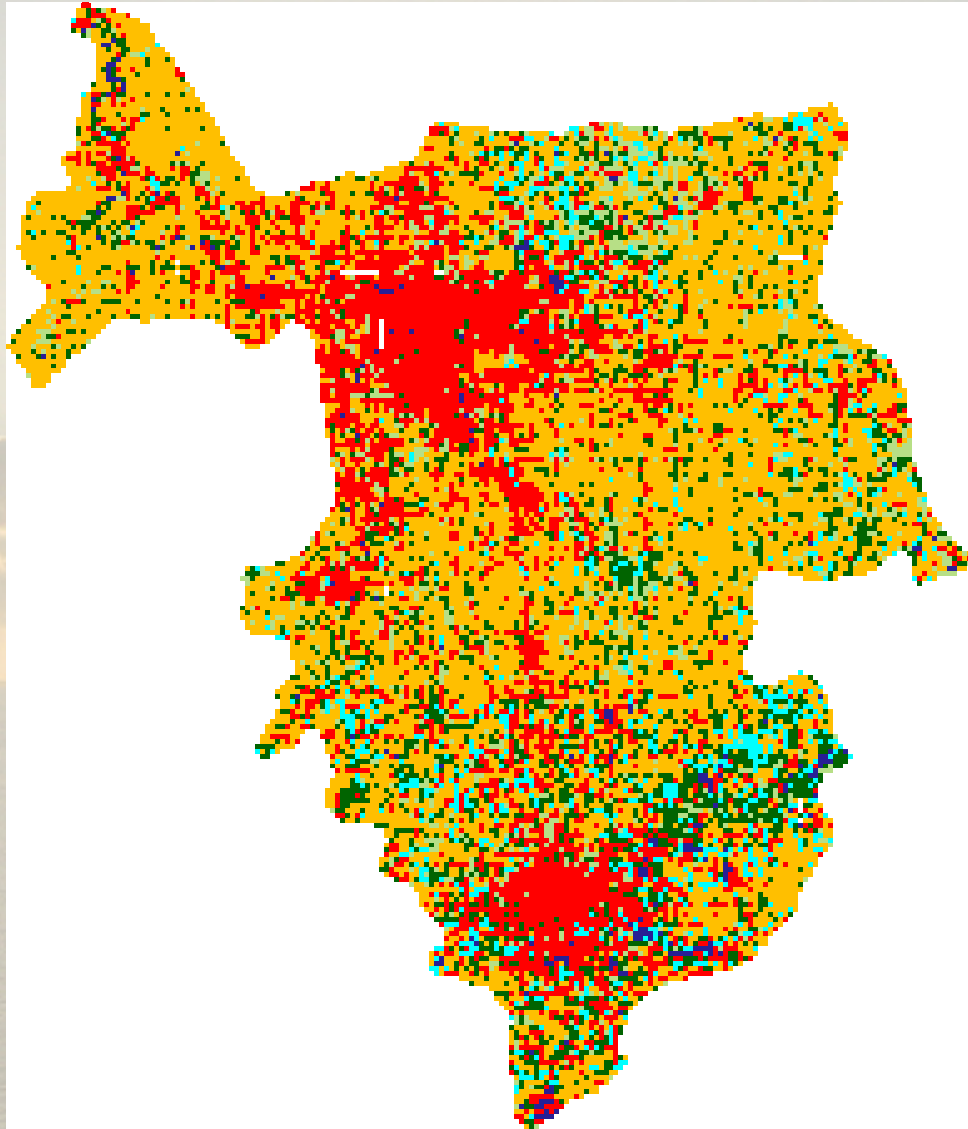
Source:

LTM (Land Transformation Model)

Computational Ecology and  
Visualization Laboratory –

Michigan State University

# The Upper Grand River Watershed Landuse 2020



Source:

LTM (Land Transformation Model)

Computational Ecology and  
Visualization Laboratory –

Michigan State University





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<http://www.epa.gov/waterspace/>

# Where Technology Is Going

## For General IT:

- Service Oriented Architecture
- Web Services
- Semantic Web through XML
- Internet-based Applications Capable of Integrating Multiple Web Services from Multiple Sources
- Grid Computing & Virtualization



# Virtual Organization (VO)

- Dynamic model for accomplishing group objectives
- Independent of the geographic location of group members
- Collaborative computing & problem solving

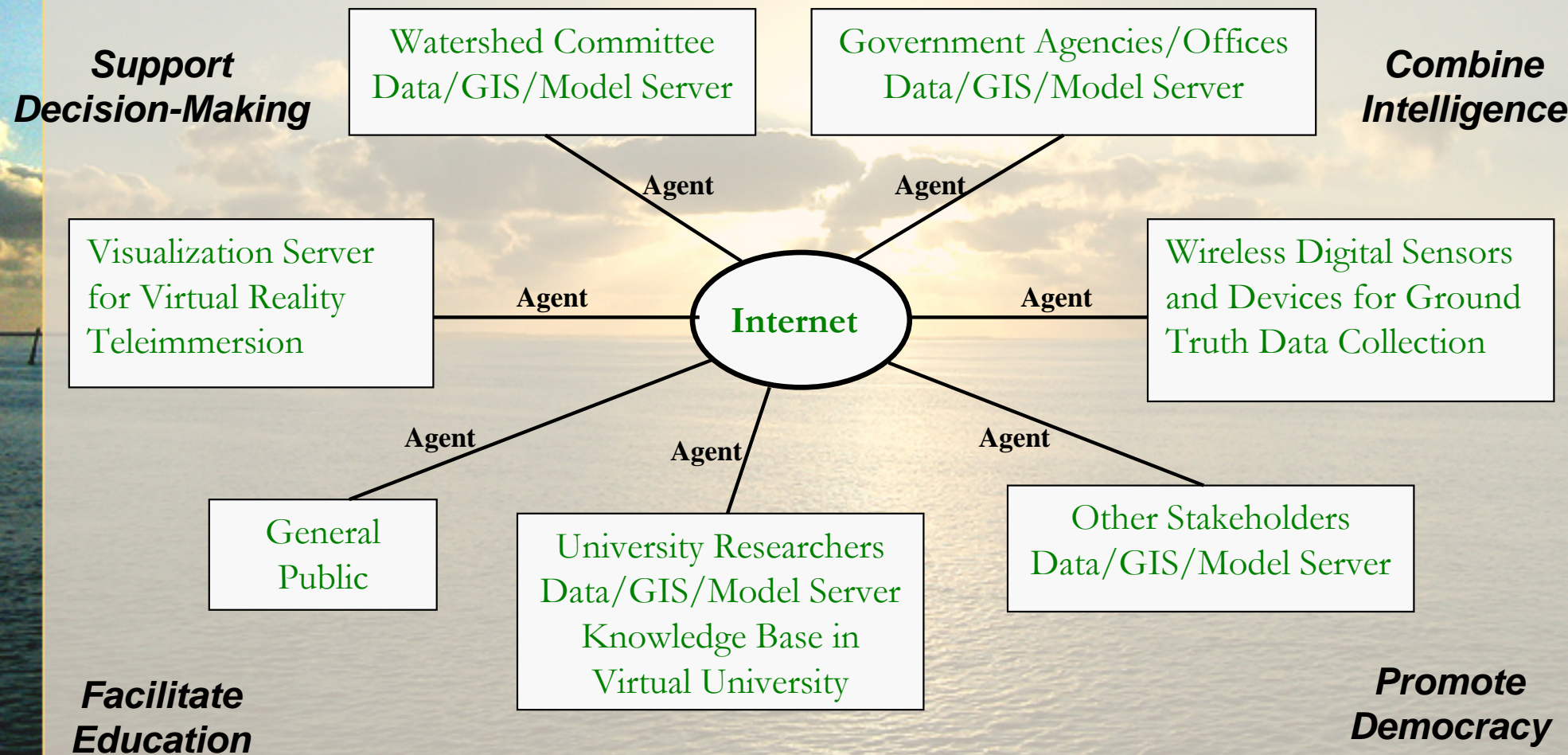
# Environmental Computing as a VO

- Multidisciplinary R & D teams
- Many locations
  - government and local agencies
  - different departments & research units
  - collaborations between universities and agencies
- High technology use and acceptance
- Defined but adaptive workflow between agents
- Common incentives and related objectives



# An Environmental Virtual Organization Grid

An Integrated Approach for Adaptive Environment and Natural Resources Management, Based on the Virtual Organization Concept



# Discussion

- Discussion





# of Water Research

**Michigan State University**

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